Geological Setting of Jason and Tom Deposits
Macmillan Pass Area ,Eastern Yukon

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GEOLOGICAL SETTING OF JASON AND TOM DEPOSITS

MACMILLAN PASS AREA, EASTERN YUKON

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INTRODUCTION

Jason and Tom stratiform massive sulfide and bedded barite-hosted Pb-Zn-Ag deposits are localized in an Upper Devonian shale-turbidite basin near Macmillan Pass, eastern Yukon. Hudson Bay Expl. & Devel. Ltd. discovered Tom by prospecting in 1951; current reserves - 9 m tons, 8.6% Pb, 8.4% Zn, 2.8 oz. Ag. Ogilvie Joint Venture (Brinex Ltd., Mitsubishi Canada Ltd., Ventures West Capital Ltd.) discovered Jason in 1974 as a result of geological-geochemical work in area of Tom. Total of 7,340 m. in 43 holes drilled to date. Cordilleran Engineering Limited manages the OJV program, O. Hairsine in charge. Geologists Dr. K. Lu, J. Rowe, R. Teal, Dr. P. Lecouteur, have made important contributions. Jason is in exploratory stage; no tonnage or grade figures released. Jason and Tom are bordered by properties held by Cominco, Inco and others.

REGIONAL

Macmillan Pass is located near the eastern margin of the Selwyn basin, a few miles east of a northwest-trending lineament which was active through early-middle Paleozoic. The lineament may reflect the continental shelf-slope hinge. Arcuate faults branch from northeast side of the lineament; one forms the west boundary of the Mac Pass graben - site of the shale-turbidite basin. The graben is located at an intersection between regional northwest-trending folds and a belt of northeast-trending folds.

PRINCIPAL GELOGICAL EVENTS (see Table and Figures)

Stage 1: Graben faulting of Road River group produced a northwest-trending trough within which a turbidite system (Unit 1) became established. Distal, lower fan (up to 1,000 m thick) and proximal mid-fan classic turbidites were supplied through two, sandstone-conglomerate-filled, incised channels which have paleoflows from the northwest. The graben filled to overflowing. Felsic ignimbrites and flows in upper Road River and a bedded barite deposit at the base of Unit 1 attest to volcanic and hydrothermal activity related to faulting.

Stage 2: Sudden progradation of turbidite system resulted in widespread chert pebble conglomerates (Unit 2). West (and probably east) graben boundary fault was active; a scarp blocked the spread of conglomerates to the west. Conglomerate is up to 200 m thick in north and has a depositional edge to south; paleoflows probably from northwest. Thin basalt flows and high-grade Pb-Zn-Ag massive sulfides in Tom-East and Jason-South zones, both in upper Unit 1, represent volcanic-hydrothermal events related to faulting.

Stage 3: Probable faulting resulted in retrograded distal classic turbidites (Unit 3A$_2$) and two sandstone-breccia filled channels (Unit 3A$_4$). Sudden deep down-dropping of graben resulted in black shales (Unit 3B) up to 1000 m thick in basin and thinner overflow shales (Unit 3B') regionally. Bedded barite-hosted Pb-Zn-Ag deposits of Tom-West and Jason-Main zones and two other bedded barite deposits near base of 3B demonstrate a hydrothermal event. Argillite clast breccias overlying Jason-Main zone near west boundary fault probably represent slump beds from scarp.

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Stage 4: Widespread classic turbidites (Unit 4) with paleoflows from the northeast indicate a re-established prograding system.

STRUCTURE

Anomalous structural settings appear at both Jason and Tom. Regional moderate-open folds change abruptly at Jason to isoclinal folds which mark the west graben boundary and the point of thickening of Unit 3B. Steep plunging, isoclinal fold noses are broken by a set of strike-slip faults which represent adjustment to intense folding. At Tom, along east graben boundary, a similar north-trending, fault-bounded, isoclinal anticline interrupts regional northwest - and east-west - trending folds.

ORE DEPOSITS

Tom-East and Jason-South zones are massive sulfides of alternately-bedded galena and sphalerite with minor pyrite and quartz. The drilled dimensions of the East zone are 160 m long, 3-20 m thick. The South zone has been intersected in only two holes 70 m apart where it is 2 m thick; continuity may be expected over considerable strike length. Grades in both zones are commonly 30-40% Pb + Zn, with several oz. Ag. Tom-West and Jason-Main zones have complex mineralogical zonation, and are characterized by laminated textures of varying amounts of barite-argillite-chert-sphalerite-galena-pyrite. West zone drilled to date: 600 m long, 3-60 m thick. Main zone drilled: 1000 m long, 2-21 m thick. Main zone has a barite-rich west half which grades about 7% Pb + Zn, over average 6 m thickness and a barite-poor east half, which grades about 13-14% Pb + Zn over average 10 m thickness. Except for a high grade section at south end of West zone, grades and metal ratios of both zones are similar.

Quartz-siderite-pyrite-galena-sphalerite-chalcopyrite stockwork veinlets and silica-rich alteration appear in epigenetic feeders beneath Jason-South and Tom-West zones.

Ore zones are all stratiform deposits which are the probable result of precipitation from heated metalliferous brines exhaled onto the sea floor in the graben-bounded basin. Brines probably acquired metals through leaching of sediments, were heated and driven up fault conduits at volcanic-geothermal centers.

POTENTIAL

At Tom, geological and geochemical evidence indicates additional untested strike lengths of 1000 m for East zone and 1800 m for West zone; both drilled zones open at depth and West zone shows marked thickness increase with depth. At Jason, geological and geochemical evidence indicates additional untested strike lengths of 3000 m for South zone and 3300 m for Main zone; depth of drilled zones not yet tested. In addition, possibility of connection across basin between Jason and Tom requires examination by deep drilling.

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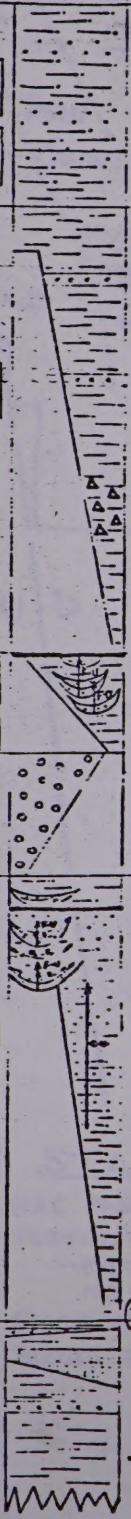
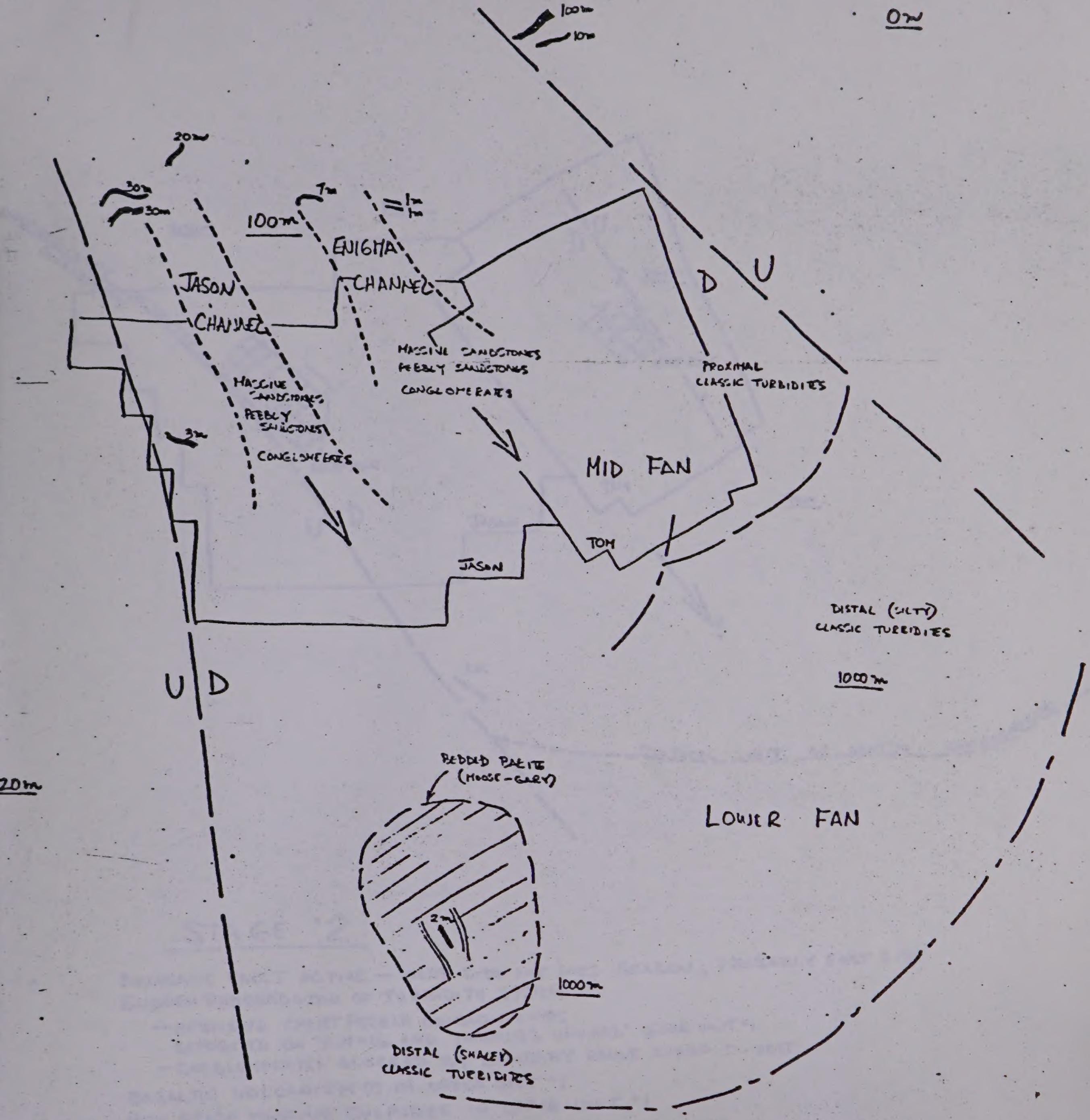
December 4, 1978

TABLE OF PRINCIPAL GEOLOGICAL EVENTS – MACMILLAN PASS AREA



	ROCK UNITS	TURBIDITES	FAULTING	VOLCANISM	HYDROTHERMAL	
IMPERIAL FORMATION	UNIT 4 4B 4A	PROXIMAL TO DISTAL, SANDY, CLASSIC TURBIDITES DEPOSITED IN BROAD FAN PALEOFLOWS FROM NORTHWEST				STAGE 4
		(TURBIDITE SYSTEM RE-ESTABLISHED)				
CANOL FORMATION	UNIT 3B 3B' 3B 3B BR	BLACK, CARBONACEOUS, SILICEOUS SHALES (100-1000m); LOCAL BEDDED CHERT GRABEN COMPLETELY FILLED AND 3B' OUTER BASIN FACIES OVERLAPS SCARPS 3B BR IS ARGILLITE CLAST BRECCIA DEPOSITED AS SLUMP BEDS, PROBABLY FROM FAULT SCARP				
		(SYSTEM RETROGRADES)				
	UNIT 3A $3A_4$ $3A_2$	DISTAL, SANDY AND SILTY CLASSIC TURBIDITES (0-200m); "FINING AND THINNING UPWARDS" MASSIVE AND PEBBLY SANDSTONES IN INCISED CHANNELS (3A).	MAC PASS GRABEN ACTIVE (DEEP BASIN CREATED)		MODERATE - LOW GRADE BARITE-HOSTED SULFIDES ([illegible]) BEDDED BARITE (RARE)	STAGE 3
	UNIT 2 2	MASSIVE CHERT PEBBLE CONGLOMERATE (0-250m) CONFINED BY SCARP ON WEST, DEPOSITIONAL EDGE ON SOUTH				
		(SUDDEN PROGRADATION OF SYSTEM)				
	UNIT 1 1C 1B	NORTHWEST (1000m): MASSIVE PEBBLY SANDSTONES AND CHERT PEBBLE CONGLOMERATES IN CHANNELS WHICH INCISED AND PROGRADED FROM THE NORTHWEST — INTERBEDDED WITH FINE SANDSTONE, SILTSTONE EAST (500m): PROXIMAL, SANDY, CLASSIC TURBIDITES IN MID-FAN SOUTH (1000m): DISTAL, SILTY AND SHALEY CLASSIC TURBIDITES IN LOWER FAN; "COARSENING AND THICKENING UPWARDS"	WEST BOUNDARY OF GRABEN ACTIVE (POSSIBLY EAST BOUNDARY, ALSO)	BASALTIC VOLCANICS (?)	HIGH GRADE [illegible] SULFIDES ([illegible])	STAGE 2
		(TURBIDITE SYSTEM ESTABLISHED)	MACPASS GRABEN ESTABLISHED	FELSIC VOLCANISM	BEDDED BARITE (MINOR - EARLY)	STAGE 1
ROAD RIVER GROUP	ROAD RIVER RR RR VOL	BLACK, CARBONACEOUS, GRAPTOLITIC SHALES (500m+); LIMESTONE; CHERT; FELSIC VOLCANICS IN UPPER PART OF UNIT (IGNIMBRITES, FLOWS)				



STAGE #1

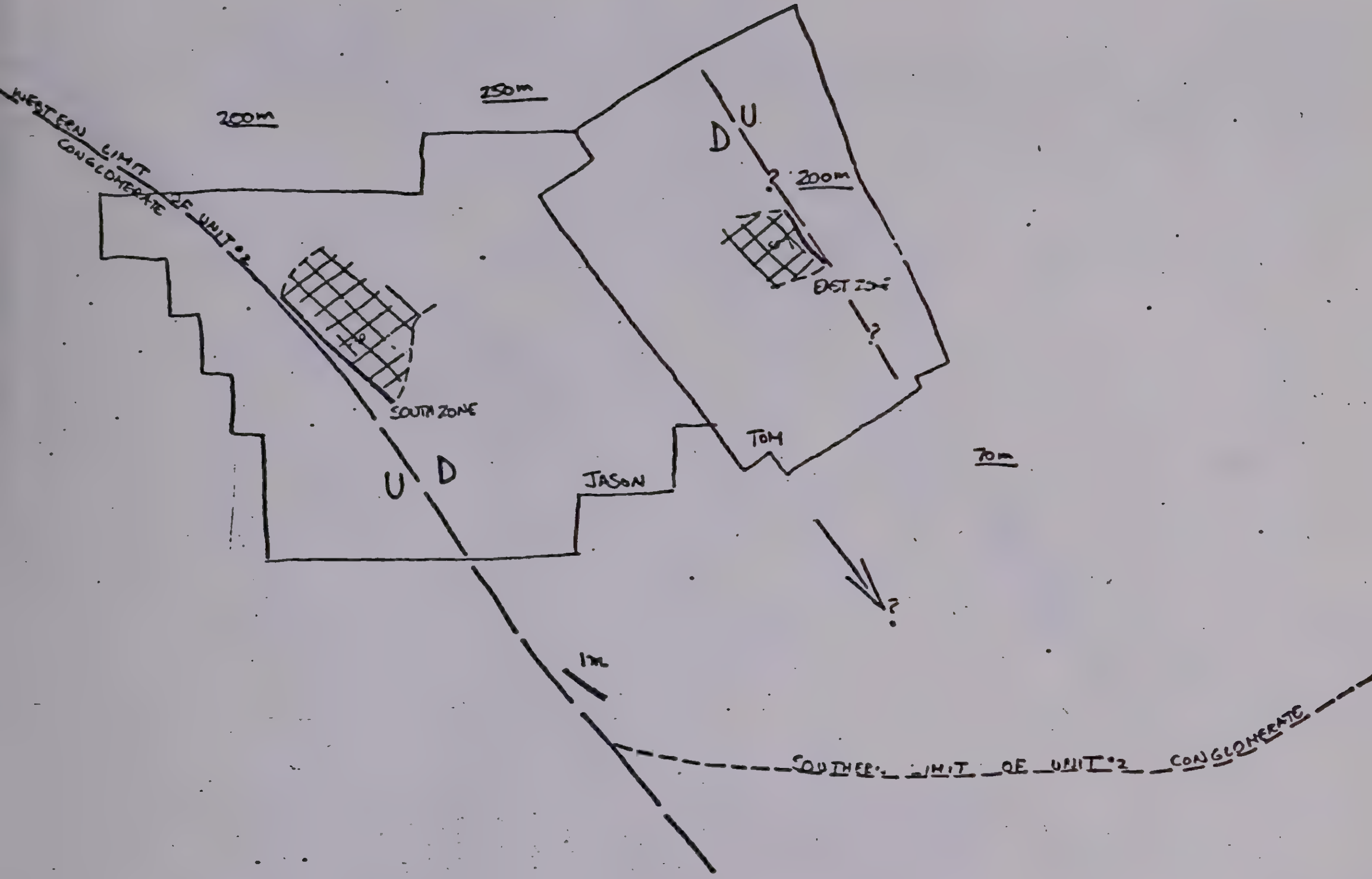
MAC PASS GRABEN DEVELOPS

TURBIDITE SYSTEM ESTABLISHED (UNIT #1 THICKNESS IN METERS)

—UNIT #1 CHANNELS FEED PROXIMAL MID FANS AND DISTAL LOWER FAN

FELSIC VOLCANISM IN UPPER ROAD RIVER—LOWER UNIT #1 (VOLCANIC THICKNESS IN METERS)

BEDDED BARITE DEPOSIT (MOOSE-GARY)


WESTERN LIMIT OF UNIT #2 CONGLOMERATE
200m
250m
D U
?
200m
EAST ZONE
?
SOUTH ZONE
U D
JASON
TOM
70m
?
1m
SOUTHERN LIMIT OF UNIT #2 CONGLOMERATE

STAGE #2

BOUNDARY FAULT ACTIVE — WEST SIDE MODIFIES GRABEN; PROBABLY EAST SIDE

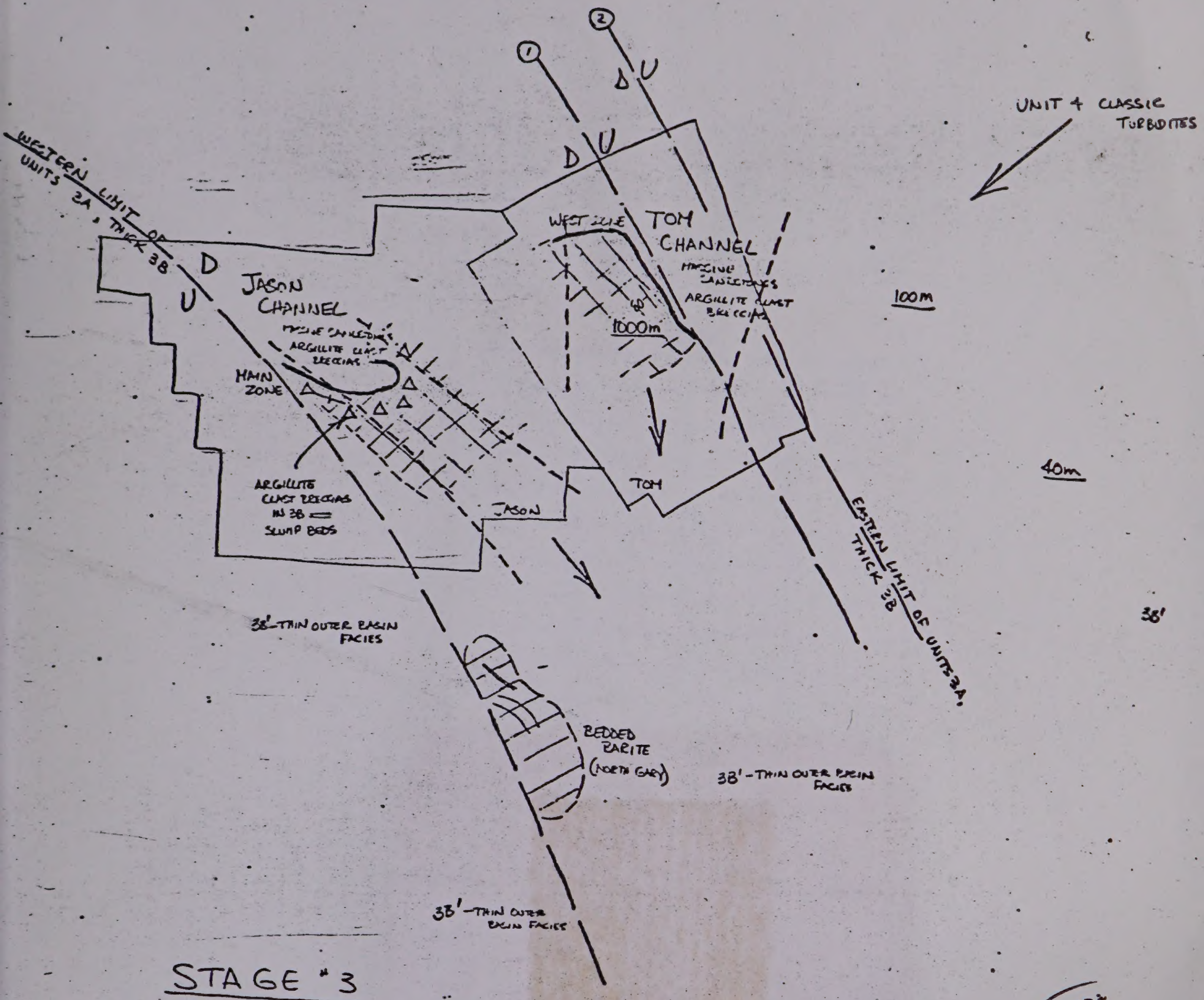
SUDDEN PROGRADATION OF TURBIDITE SYSTEM

- EXTENSIVE CHERT PEBBLE CONGLOMERATES DEPOSITED ON "FINING AND THINNING UPWARD" UPPER UNIT #1
- CONGLOMERATES BLOCKED BY BOUNDARY FAULT SCARP ON WEST

BASALTIC VOLCANISM (?) IN UPPER UNIT #1

HIGH GRADE MASSIVE SULFIDES IN UPPER UNIT #1

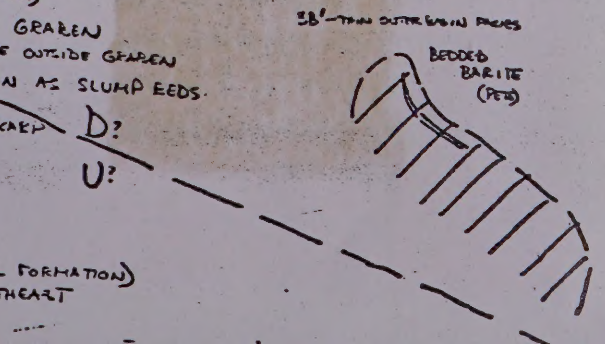
- TOM-EAST ZONE
- JASON - SOUTH ZONE


① ②
D U
D U
UNIT 4 CLASSIC TURBIDITES
WESTERN LIMIT OF UNITS 3A & THICK 3B
D
U
JASON CHANNEL
MASSIVE SANDSTONES
ARGILLITE CLAST BRECCIAS
MAIN ZONE
ARGILLITE CLAST BRECCIAS IN 3B = SLUMP BEDS
JASON
WEST ZONE
TOM CHANNEL
MASSIVE SANDSTONES
ARGILLITE CLAST BRECCIAS
40°
1000m
TOM
100m
40m
EASTERN LIMIT OF UNITS 3A THICK 3B
3B'
3B'–THIN OUTER BASIN FACIES
BEDDED BARITE (NORTH GARY)
3B'–THIN OUTER BASIN FACIES
3B'–THIN OUTER BASIN FACIES

just 3B outline

STAGE #3

UNIT 3A CHANNELS INCISED FROM NORTHWEST INTO
RETROGRADING UNIT 3A DISTAL TURBIDITE SYSTEM
WHICH COVERED UNIT #2 CONGLOMERATES
MAC PASS GRABEN ACTIVE – DEEP BASIN CREATED
MODERATE–LOW GRADE, BARITE-HOSTED DEPOSITS LAID DOWN
AT BASE OF UNIT 3B BLACK SHALES
BEDDED BARITE DEPOSITS (NORTH GARY, PETE)
THICK UNIT #3B BLACK SHALES FILL GRABEN
THIN 3B' OUTER BASIN FACIES EXTENSIVE OUTSIDE GRABEN
ARGILLITE CLAST BRECCIAS LAID DOWN AS SLUMP BEDS.
ALONG JASON MAIN ZONE —
PROBABLY SLUMPED FROM FAULT SCARP



STAGE 4

UNIT 4 CLASSIC TURBIDITES (IMPERIAL FORMATION)
SPREAD REGIONALLY FROM THE NORTHEAST
(NO SCARPS REMAIN)

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AUTHOR
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